

SEQUENCE LISTING

<110> Ohmiya, Yoshihiro
Nakajima, Yoshihiro

<120> Multiple gene transcription activity assay system

<130> SAEG129.016APC

<140> 10/555,544

<141> 2004-11-04

<150> JP2003-127629

<151> 2003-05-06

<150> JP2003-407564

<151> 2003-12-05

<160> 65

<170> PatentIn version 3.1

<210> 1

<211> 1638

<212> DNA

<213> Wild Type *Phrixothrix* Green Luciferase

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<212> PRT

<213> Wild Type *Phrixothrix* Green Luciferase

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Gly His Leu Asn Ile Ser Lys Pro Thr Ile Met Phe Ser Ser Lys Lys
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Lys Val Val Val Ile Asp Ser Met Tyr Asp Ile Asn Gly Val Glu Cys
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Ser Phe Thr Pro Lys Asp Phe Asp Pro Leu Glu Lys Ile Ala Leu Ile
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Gly Thr Arg Thr Val Pro Gln Thr Ser Ile Leu Ser Leu Val Pro Phe
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Tyr Gly Leu Thr Glu Thr Cys Cys Ala Val Met Ile Thr Pro His Asn
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Lys Val Leu Asp Asn Ala Thr Gly Lys Ala Leu Gly Pro Gly Glu Arg
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Asn Pro Glu Ala Thr Ile Asp Thr Ile Asp Lys Asp Gly Trp Leu His
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Ser Gly Asp Ile Gly Tyr Tyr Asp Glu Asp Gly Asn Phe Ile Val
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Asp Arg Leu Lys Glu Leu Ile Lys Tyr Lys Gly Tyr Gln Val Ala Pro
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Ala Glu Leu Glu Asn Leu Leu Gln His Pro Ser Ile Ala Asp Ala
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Gly Val Thr Gly Val Pro Asp Glu Phe Ala Gly Gln Leu Pro Ala Ala
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Cys Val Val Leu Glu Ser Gly Lys Thr Leu Thr Glu Lys Glu Val Gln
485 490 495

Asp Phe Ile Ala Ala Gln Val Thr Pro Thr Lys His Leu Arg Gly Gly
500 505 510

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Leu
545

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<213> Wild Type Phrixothrix Red Luciferase

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gcagttagtc tagaaaaata tggcttggat cataacaatg ttgtggcaat atgcagtgaa	240
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<213> Wild Type Phrixothrix Red Luciferase

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35 40 45

Ser Tyr Ala Gln Ile Phe Glu Thr Ser Cys Arg Leu Ala Val Ser Leu
50 55 60

Glu Lys Tyr Gly Leu Asp His Asn Asn Val Val Ala Ile Cys Ser Glu
65 70 75 80

Asn Asn Ile His Phe Phe Gly Pro Leu Ile Ala Ala Leu Tyr Gln Gly
85 90 95

Ile Pro Met Ala Thr Ser Asn Asp Met Tyr Thr Glu Arg Glu Met Ile
100 105 110

Gly His Leu Asn Ile Ser Lys Pro Cys Leu Met Phe Cys Ser Lys Lys
115 120 125

Ser Leu Pro Phe Ile Leu Lys Val Gln Lys His Leu Asp Phe Leu Lys
130 135 140

Lys Val Ile Val Ile Asp Ser Met Tyr Asp Ile Asn Gly Val Glu Cys
145 150 155 160

Val Phe Ser Phe Val Ser Arg Tyr Thr Asp His Ala Phe Asp Pro Val
165 170 175

Lys Phe Asn Pro Lys Glu Phe Asp Pro Leu Glu Arg Thr Ala Leu Ile
180 185 190

Met Thr Ser Ser Gly Thr Thr Gly Leu Pro Lys Gly Val Val Ile Ser
195 200 205

His Arg Ser Ile Thr Ile Arg Phe Val His Ser Ser Asp Pro Ile Tyr
210 215 220

Gly Thr Arg Ile Ala Pro Asp Thr Ser Ile Leu Ala Ile Ala Pro Phe
225 230 235 240

His His Ala Phe Gly Leu Phe Thr Ala Leu Ala Tyr Phe Pro Val Gly
245 250 255

Leu Lys Ile Val Met Val Lys Lys Phe Glu Gly Glu Phe Phe Leu Lys
260 265 270

Thr Ile Gln Asn Tyr Lys Ile Ala Ser Ile Val Val Pro Pro Pro Ile
275 280 285

Met Val Tyr Leu Ala Lys Ser Pro Leu Val Asp Glu Tyr Asn Leu Ser
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Ser Leu Thr Glu Ile Ala Cys Gly Gly Ser Pro Leu Gly Arg Asp Ile
305 310 315 320

Ala Asp Lys Val Ala Lys Arg Leu Lys Val His Gly Ile Leu Gln Gly
325 330 335

Tyr Gly Leu Thr Glu Thr Cys Ser Ala Leu Ile Leu Ser Pro Asn Asp
340 345 350

Arg Glu Leu Lys Lys Gly Ala Ile Gly Thr Pro Met Pro Tyr Val Gln
355 360 365

Val Lys Val Ile Asp Ile Asn Thr Gly Lys Ala Leu Gly Pro Arg Glu
370 375 380

Lys Gly Glu Ile Cys Phe Lys Ser Gln Met Leu Met Lys Gly Tyr His

385

390

395

400

Asn Asn Pro Gln Ala Thr Arg Asp Ala Leu Asp Lys Asp Gly Trp Leu
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His Thr Gly Asp Leu Gly Tyr Tyr Asp Glu Asp Arg Phe Ile Tyr Val
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Val Asp Arg Leu Lys Glu Leu Ile Lys Tyr Lys Gly Tyr Gln Val Ala
435 440 445

Pro Ala Glu Leu Glu Asn Leu Leu Leu Gln His Pro Asn Ile Ser Asp
450 455 460

Ala Gly Val Ile Gly Ile Pro Asp Glu Phe Ala Gly Gln Leu Pro Ser
465 470 475 480

Ala Cys Val Val Leu Glu Pro Gly Lys Thr Met Thr Glu Lys Glu Val
485 490 495

Gln Asp Tyr Ile Ala Glu Leu Val Thr Thr Thr Lys His Leu Arg Gly
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Gly Val Val Phe Ile Asp Ser Ile Pro Lys Gly Pro Thr Gly Lys Leu
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ctgccccaaag	gggtcggtt	aacccatcga	aatttaagcg	ttcgcttcgt	acactgcaag		660
gatcccttat	tcggcacaag	aactattcca	tcaacttcga	tttatctat	cgttcccttc		720
catcatgcgt	ttggaatgtt	tacaacgtt	tcttatttt	tagtagggct	tagagttgt		780
ttactgaaaa	gattcgaaga	gaagttttc	ttaagcacca	ttgaaaagta	cagaattcca		840
actatcgttc	ttgcgcgc	cgtaatggta	ttcctagcta	agagcccctt	agttgatcag		900
tacgatttgcgt	ccagtatttag	agaagtcgct	accgggtggcg	cacctgttgg	aactgaagt		960
gcagtggccg	ttgcgaaacg	gttggaaattt	ggcgaaatcc	ttcagggcta	cgatttgacc		1020
gaaacgtgtt	gcccgtatt	aattaccctt	catgacgacg	ttaaaacagg	ttctaccggg		1080
aggtagctc	tttacgttcca	agcggaaattt	gtagatctt	ccaccggaaa	atctctgggg		1140
ccaaataaaa	gaggagagct	ttgtttttaa	agttagatca	ttatgaaggg	ctatttcaac		1200
aataaacaag	ctacggaaga	agccatcgat	aaagaaggat	ggttacattc	tggagatgtt		1260
gggttattatg	acgacgatgg	tcatttcttc	gtagtcgatc	gtttaaagga	acttatcaag		1320

tacaaggat atcaagtagc accggctgaa ctggagtgg tgcgttgca acatccatct	1380
attaaagatg ccgggtttac tggcgttccc gacgaagctg ctggagaact accaggtgct	1440
tgtatagttc tccaagaagg aaaaagtctt actgaacaag aaattattga ctatatagcc	1500
gaacgagttt cgccaaactaa acgtatacgt ggtggagtgg tcttcgttga tgatattcct	1560
aaaggggcga ctggaaaact ggtcagaagt gaattacgaa aacttcttgc tcagaagaaa	1620
tcgaaaactat aa	1632

<210> 9
 <211> 1632
 <212> DNA
 <213> Wild Type Rhagophthalmus ohbai Orange Luciferase

<400> 9	
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gcaggaattc aattgtatacg ggcttgacg aattttcct ttttaaggga agccttgatc	120
gacgctcaca ccgaggaagt agtatcttac gcggacattt tggaaaacag ctgtcgatta	180
gcaaaatgct acgaaaacta tggattacgc caaaacagcg tcatatcggt gtgcagcgaa	240
aacagcacga tcttcttcta cccgtaatt gccgcttgt atatggagt cataacagca	300
accgtaaatg atagttatac cgaacggaa ttattggaaa ccttaaatat atcaaaaccg	360
gaatttagtgt tctgctcgaa gaaagccatt aaaaatatga tggcattgaa aaggaacgta	420
aattttatta aaaaggttgt acttttggat agtaaggaag acatggcgaa agccagtgt	480
cttagcaact ttatggcacg ctattcgaa cccaaatttgg acgtaagaaa ttttaaacca	540
cgcgattttg atgctaaaga acaagtcgct ttgatcatgt cctcatcggt aacaaccggg	600
ctgccccaaag gggtcgtgtt aacccatcgaa aatttaagcg ttgcgttcgt acactgcaag	660
gatcccttat tcggcaatag aactattcca tcaacttcga ttttatctat cgttcccttc	720
catcatcggt ttggaatgtt tacaacgttg tcttattttta tagtagggct tagagttgt	780
ttactgaaaa gattcgaaga gaagttttc ttaagcacca ttgaaaagta cagaattcca	840
actatcgttc ttgcgccgccc cgtaatggta ttccatcgta agagccctt agttgatcag	900
tacgatttgt ccagtatttag agaagtcgct accgggtggcg cacctgttgg aactgaagt	960
gcagtgcccg ttgcgaaacg gttgaaaatt ggcggaatcc ttcaaggctt cggattgacc	1020
gaaacgtgtt gcgccgtatt aattaccctt catgacgacg taaaacagg ttctaccggg	1080
aggtagctc cttacgttca agcgaaaatt gtagatctt ccaccggaaa atctctgggg	1140

ccaaataaaa	gaggagagct	ttgtttaaa	agttagatca	ttatgaaggg	ctatttcaac	1200
aataaacaag	ctacggaaga	agccatcgat	aaagaaggat	ggttacattc	tggagatgtt	1260
gggtattatg	acgacgatgg	tcatttcttc	gtagtcgatc	gtttaaagga	acttatcaag	1320
tacaagggat	atcaagttagc	accggctgaa	ctggagtgg	tgctttgca	acatccatct	1380
ataaaagatg	ccgggtttac	tggcgttccc	gacgaagctg	ctggagaact	accaggtgct	1440
tgtatagttc	tccaagaagg	aaaaagtctt	actgaacaag	aaattattga	ctatatagcc	1500
gaacgagttt	cgc当地actaa	acgtatacgt	ggtggagtgg	tcttcgttga	tgatattcct	1560
aaaggggcga	ctggaaaact	ggtcagaagt	gaattacgaa	aacttcttgc	tcagaagaaa	1620
tcgaaactat	aa					1632

<210> 10

<211> 1632

<212> DNA

<213> Mutant Rhagophthalmus ohbai Green Luciferase of the Invention

<400> 10

atggcttaacg	agatcatcct	gcacggcgcc	aagcccaggg	acccccgttga	cctgggcacc	60
gccggcattc	agctctacag	ggccctgacc	aacttctcct	tcctgaggga	ggccctgatc	120
gacgcccaca	ccgaggaggt	ggtgtcttac	gccgacatcc	tggagaacag	ctgttagactg	180
gctaagtgtct	acgagaacta	cggcctgcgc	cagaacagcg	tgatctccgt	gtgcagcgcg	240
aatagcacca	tcttcttcta	ccccgtgatc	gccgcccgt	acatgggcgt	gatcaccgc	300
accgtgaacg	acagctacac	cgagcgggag	ctgctggaga	ccctgaacat	ctccaagccc	360
gaactgggt	tctgctccaa	gaaggccatc	aagaacatga	tggccctgaa	gaggaacgtg	420
aacttcatca	agaaggtgg	gctgctggac	agcaaggagg	atatgggcga	ggcccagtgc	480
ctgagcaact	tcatggcccg	gtactccgag	cccaacctgg	acgtgagaaa	cttcaagcca	540
agggacttcg	acgccaagga	gcaggtggcc	cttattatgt	cctcctctgg	caccaccggc	600
ctgccaagg	gcgtggtgct	gacccacagg	aacctgagcg	tgcgcttcgt	ccactgcaag	660
gacccccgt	tcggcaccag	aaccatcccc	tccaccccca	tcctgtccat	cgtcccttc	720
caccacgcct	tcggaatgtt	cacaaccctg	tcctacttca	tcgtgggcct	gagagtgg	780
ctgctgaaga	gattcgagga	gaagttcttc	ctgagcacca	tcgagaagta	cagaatccc	840
acaatcgtgc	tggccctcc	tgtgatgg	ttcctggcta	agagccccct	ggtggaccag	900
tacgacctgt	ccagcatcag	agaggtggcc	accggcggcg	ccctgtggg	caccgagg	960

gcccgtggccg	tggccaagcg	gctgaagatc	ggcggcatcc	tccagggcta	cggcctgacc	1020
gagacctgct	gcgcgtgct	gatcacccccc	cacgacgacg	tgaagaccgg	ctccaccggc	1080
aggtagccc	cctacgtgca	ggctaagatc	gtggacctga	ccaccggcaa	gtccctggga	1140
cctaacaaga	gaggcgagct	gtgcttcaag	agcgagatca	tcatgaaggg	ctacttcaac	1200
aacaagcagg	ccaccgagga	ggccatcgac	aaggagggct	ggctgcactc	cggcgacgtg	1260
ggatactacg	acgacgatgg	acatttcttc	gtggtgacc	ggctgaaaga	gctgatcaag	1320
tacaagggct	accaggtggc	ccccgcccag	ctggagtggc	tgctgctcca	gcaccatcc	1380
atcaaggatg	ccggcgtgac	cgcggtgccc	gacgaggccg	ccggcgagct	gcccggcgcc	1440
tgcatcgtgc	tccaggaggg	caagagcctg	accgagcagg	agatcatcga	ctacatcgcc	1500
gagcgagtgt	ctcccaccaa	gcccacccgg	ggcggagtcg	tcttcgtgga	cgacatcccc	1560
aaggcgcca	ccggcaagct	ggtgagaagc	gagctgcgga	agctgctggc	ccagaagaag	1620
tccaaagctgt	aa					1632

<210> 11
 <211> 1632
 <212> DNA
 <213> Mutant Rhagophthalmus ohbai Orange Luciferase of the Invention

<400> 11	atggctaacg	agatcatcct	gcacggcgcc	aagcccaggg	accccttgg	cctgggcacc	60
	gccccattc	agctctacag	ggccctgacc	aacttctcct	tcctgaggg	ggccctgatc	120
	gaccccaca	ccgaggaggt	ggtgtttac	gccgacatcc	tggagaacag	ctgttagactg	180
	gctaaatgt	acgagaacta	cgccctgcgc	cagaacagcg	tgatctccgt	gtgcagcgag	240
	aatagcacca	tcttcttcta	ccccgtgatc	gccgcctgt	acatgggcgt	gatcaccgccc	300
	accgtgaacg	acagctacac	cgagcgggag	ctgctggaga	ccctgaacat	ctccaagccc	360
	gaactgggt	tctgctccaa	gaaggccatc	aagaacatga	tggccctgaa	gaggaacgtg	420
	aacttcatca	agaagggttgt	gctgctggac	agcaaggagg	atatggcgaa	ggcccagtgc	480
	ctgagcaact	tcatggcccg	gtactccgag	cccaacctgg	acgtgagaaa	cttcaagccca	540
	aggacttcg	acgccaagga	gcaggtggcc	cttattatgt	cctcctctgg	caccaccggc	600
	ctgccaaagg	gcgtggtgct	gaccacagg	aacctgagcg	tgcgcttcgt	ccactgcaag	660
	gacccttgcgt	tcggcaacag	aaccatcccc	tccacctcca	tcctgtccat	cgtcccttc	720
	caccacgcct	tcggaatgtt	cacaaccctg	tcctacttca	tcgtgggcct	gagagtggtg	780

ctgctgaaga	gattcgagga	gaagttcttc	ctgagcacca	tcgagaagta	cagaatccca	840
acaatcgtgc	tggccctcc	tgtgatggtg	ttcctggcta	agagccccct	ggtggaccag	900
tacgacctgt	ccagcatcag	agaggtggcc	accggcggcg	cccctgtggg	caccgaggtt	960
gccgtggccg	tggccaagcg	gctgaagatc	ggcggcatcc	tccagggcta	cggcctgacc	1020
gagacctgct	gcgccgtgct	gatcacccccc	cacgacgacg	tgaagaccgg	ctccaccggc	1080
aggtagccc	cctacgtgca	ggctaagatc	gtggacactga	ccaccggcaa	gtccctggga	1140
cctaacaaga	gaggcgagct	gtgcttcaag	agcgagatca	tcatgaaggg	ctacttcaac	1200
aacaaggcagg	ccaccgagga	ggccatcgac	aaggagggct	ggctgcactc	cggcgacgtg	1260
ggatactacg	acgacgatgg	acatttcttc	gtggtgacc	ggctgaaaga	gctgatcaag	1320
tacaagggct	accaggtggc	ccccgcccag	ctggagtggc	tgctgctcca	gcaccatcc	1380
atcaaggatg	ccggcgtgac	cggcgtgccc	gacgaggccg	ccggcgagct	gcccggcgcc	1440
tgcacatgtgc	tccaggaggg	caagagcctg	accgagcagg	agatcatcga	ctacatcgcc	1500
gagcgagtgt	ctcccaccaa	gcatccgg	ggcggagtcg	tcttcgtgga	cgacatcccc	1560
aaggcgcca	ccggcaagct	ggtgagaagc	gagctgcgga	agctgctggc	ccagaagaag	1620
tccaagctgt	aa					1632

<210> 12
 <211> 543
 <212> PRT
 <213> Wild Type Rhagophthalmus ohbai Green Luciferase
 <400> 12

Met	Pro	Asn	Glu	Ile	Ile	Leu	His	Gly	Ala	Lys	Pro	Arg	Asp	Pro	Leu
1				5					10			15			

Asp	Leu	Gly	Thr	Ala	Gly	Ile	Gln	Leu	Tyr	Arg	Ala	Leu	Thr	Asn	Phe
						20		25				30			

Ser	Phe	Leu	Arg	Glu	Ala	Leu	Ile	Asp	Ala	His	Thr	Glu	Glu	Val	Val
							35	40			45				

Ser	Tyr	Ala	Asp	Ile	Leu	Glu	Asn	Ser	Cys	Arg	Leu	Ala	Lys	Cys	Tyr
				50		55				60					

Glu	Asn	Tyr	Gly	Leu	Arg	Gln	Asn	Ser	Val	Ile	Ser	Val	Cys	Ser	Glu
						65		70		75			80		

Asn Ser Thr Ile Phe Phe Tyr Pro Val Ile Ala Ala Leu Tyr Met Gly
85 90 95

Val Ile Thr Ala Thr Val Asn Asp Ser Tyr Thr Glu Arg Glu Leu Leu
100 105 110

Glu Thr Leu Asn Ile Ser Lys Pro Glu Leu Val Phe Cys Ser Lys Lys
115 120 125

Ala Ile Lys Asn Met Met Ala Leu Lys Arg Asn Val Asn Phe Ile Lys
130 135 140

Lys Val Val Leu Leu Asp Ser Lys Glu Asp Met Gly Glu Ala Gln Cys
145 150 155 160

Leu Ser Asn Phe Met Ala Arg Tyr Ser Glu Pro Asn Leu Asp Val Arg
165 170 175

Asn Phe Lys Pro Arg Asp Phe Asp Ala Lys Glu Gln Val Ala Leu Ile
180 185 190

Met Ser Ser Ser Gly Thr Thr Gly Leu Pro Lys Gly Val Val Leu Thr
195 200 205

His Arg Asn Leu Ser Val Arg Phe Val His Cys Lys Asp Pro Leu Phe
210 215 220

Gly Thr Arg Thr Ile Pro Ser Thr Ser Ile Leu Ser Ile Val Pro Phe
225 230 235 240

His His Ala Phe Gly Met Phe Thr Thr Leu Ser Tyr Phe Ile Val Gly
245 250 255

Leu Arg Val Val Leu Leu Lys Arg Phe Glu Glu Lys Phe Phe Leu Ser
260 265 270

Thr Ile Glu Lys Tyr Arg Ile Pro Thr Ile Val Leu Ala Pro Pro Val
275 280 285

Met Val Phe Leu Ala Lys Ser Pro Leu Val Asp Gln Tyr Asp Leu Ser
290 295 300

Ser Ile Arg Glu Val Ala Thr Gly Gly Ala Pro Val Gly Thr Glu Val
305 310 315 320

Ala Val Ala Val Ala Lys Arg Leu Lys Ile Gly Gly Ile Leu Gln Gly
325 330 335

Tyr Gly Leu Thr Glu Thr Cys Cys Ala Val Leu Ile Thr Pro His Asp
340 345 350

Asp Val Lys Thr Gly Ser Thr Gly Arg Val Ala Pro Tyr Val Gln Ala
355 360 365

Lys Ile Val Asp Leu Thr Thr Gly Lys Ser Leu Gly Pro Asn Lys Arg
370 375 380

Gly Glu Leu Cys Phe Lys Ser Glu Ile Ile Met Lys Gly Tyr Phe Asn
385 390 395 400

Asn Lys Gln Ala Thr Glu Glu Ala Ile Asp Lys Glu Gly Trp Leu His
405 410 415

Ser Gly Asp Val Gly Tyr Tyr Asp Asp Asp Gly His Phe Phe Val Val
420 425 430

Asp Arg Leu Lys Glu Leu Ile Lys Tyr Lys Gly Tyr Gln Val Ala Pro
435 440 445

Ala Glu Leu Glu Trp Leu Leu Gln His Pro Ser Ile Lys Asp Ala
450 455 460

Gly Val Thr Gly Val Pro Asp Glu Ala Ala Gly Glu Leu Pro Gly Ala
465 470 475 480

Cys Ile Val Leu Gln Glu Gly Lys Ser Leu Thr Glu Gln Glu Ile Ile
485 490 495

Asp Tyr Ile Ala Glu Arg Val Ser Pro Thr Lys Arg Ile Arg Gly Gly
500 505 510

Val Val Phe Val Asp Asp Ile Pro Lys Gly Ala Thr Gly Lys Leu Val
515 520 525

Arg Ser Glu Leu Arg Lys Leu Leu Ala Gln Lys Lys Ser Lys Leu
530 535 540

<210> 13
<211> 543
<212> PRT
<213> Wild Type Rhagophthalmus ohbai Orange Luciferase

<400> 13

Met Pro Asn Glu Ile Ile Leu His Gly Ala Lys Pro Arg Asp Pro Leu
1 5 10 15

Asp Leu Gly Thr Ala Gly Ile Gln Leu Tyr Arg Ala Leu Thr Asn Phe
20 25 30

Ser Phe Leu Arg Glu Ala Leu Ile Asp Ala His Thr Glu Glu Val Val
35 40 45

Ser Tyr Ala Asp Ile Leu Glu Asn Ser Cys Arg Leu Ala Lys Cys Tyr
50 55 60

Glu Asn Tyr Gly Leu Arg Gln Asn Ser Val Ile Ser Val Cys Ser Glu
65 70 75 80

Asn Ser Thr Ile Phe Phe Tyr Pro Val Ile Ala Ala Leu Tyr Met Gly
85 90 95

Val Ile Thr Ala Thr Val Asn Asp Ser Tyr Thr Glu Arg Glu Leu Leu
100 105 110

Glu Thr Leu Asn Ile Ser Lys Pro Glu Leu Val Phe Cys Ser Lys Lys
115 120 125

Ala Ile Lys Asn Met Met Ala Leu Lys Arg Asn Val Asn Phe Ile Lys
130 135 140

Lys Val Val Leu Leu Asp Ser Lys Glu Asp Met Gly Glu Ala Gln Cys
145 150 155 160

Leu Ser Asn Phe Met Ala Arg Tyr Ser Glu Pro Asn Leu Asp Val Arg
165 170 175

Asn Phe Lys Pro Arg Asp Phe Asp Ala Lys Glu Gln Val Ala Leu Ile
180 185 190

Met Ser Ser Ser Gly Thr Thr Gly Leu Pro Lys Gly Val Val Leu Thr
195 200 205

His Arg Asn Leu Ser Val Arg Phe Val His Cys Lys Asp Pro Leu Phe
210 215 220

Gly Asn Arg Thr Ile Pro Ser Thr Ser Ile Leu Ser Ile Val Pro Phe
225 230 235 240

His His Ala Phe Gly Met Phe Thr Thr Leu Ser Tyr Phe Ile Val Gly
245 250 255

Leu Arg Val Val Leu Leu Lys Arg Phe Glu Glu Lys Phe Phe Leu Ser
260 265 270

Thr Ile Glu Lys Tyr Arg Ile Pro Thr Ile Val Leu Ala Pro Pro Val
275 280 285

Met Val Phe Leu Ala Lys Ser Pro Leu Val Asp Gln Tyr Asp Leu Ser
290 295 300

Ser Ile Arg Glu Val Ala Thr Gly Gly Ala Pro Val Gly Thr Glu Val
305 310 315 320

Ala Val Ala Val Ala Lys Arg Leu Lys Ile Gly Gly Ile Leu Gln Gly
325 330 335

Tyr Gly Leu Thr Glu Thr Cys Cys Ala Val Leu Ile Thr Pro His Asp
340 345 350

Asp Val Lys Thr Gly Ser Thr Gly Arg Val Ala Pro Tyr Val Gln Ala
355 360 365

Lys Ile Val Asp Leu Thr Thr Gly Lys Ser Leu Gly Pro Asn Lys Arg
370 375 380

Gly Glu Leu Cys Phe Lys Ser Glu Ile Ile Met Lys Gly Tyr Phe Asn
385 390 395 400

Asn Lys Gln Ala Thr Glu Glu Ala Ile Asp Lys Glu Gly Trp Leu His
405 410 415

Ser Gly Asp Val Gly Tyr Tyr Asp Asp Asp Gly His Phe Phe Val Val
420 425 430

Asp Arg Leu Lys Glu Leu Ile Lys Tyr Lys Gly Tyr Gln Val Ala Pro
435 440 445

Ala Glu Leu Glu Trp Leu Leu Leu Gln His Pro Ser Ile Lys Asp Ala
450 455 460

Gly Val Thr Gly Val Pro Asp Glu Ala Ala Gly Glu Leu Pro Gly Ala
465 470 475 480

Cys Ile Val Leu Gln Glu Gly Lys Ser Leu Thr Glu Gln Glu Ile Ile
485 490 495

Asp Tyr Ile Ala Glu Arg Val Ser Pro Thr Lys Arg Ile Arg Gly Gly
500 505 510

Val Val Phe Val Asp Asp Ile Pro Lys Gly Ala Thr Gly Lys Leu Val
515 520 525

Arg Ser Glu Leu Arg Lys Leu Leu Ala Gln Lys Lys Ser Lys Leu
530 535 540

<210> 14

<211> 543

<212> PRT

<213> Mutant Rhagophthalmus ohbai Green Luciferase of the Invention

<400> 14

Met Ala Asn Glu Ile Ile Leu His Gly Ala Lys Pro Arg Asp Pro Leu
1 5 10 15

Asp Leu Gly Thr Ala Gly Ile Gln Leu Tyr Arg Ala Leu Thr Asn Phe
20 25 30

Ser Phe Leu Arg Glu Ala Leu Ile Asp Ala His Thr Glu Glu Val Val
35 40 45

Ser Tyr Ala Asp Ile Leu Glu Asn Ser Cys Arg Leu Ala Lys Cys Tyr
50 55 60

Glu Asn Tyr Gly Leu Arg Gln Asn Ser Val Ile Ser Val Cys Ser Glu

65

70

75

80

Asn Ser Thr Ile Phe Phe Tyr Pro Val Ile Ala Ala Leu Tyr Met Gly
85 90 95

Val Ile Thr Ala Thr Val Asn Asp Ser Tyr Thr Glu Arg Glu Leu Leu
100 105 110

Glu Thr Leu Asn Ile Ser Lys Pro Glu Leu Val Phe Cys Ser Lys Lys
115 120 125

Ala Ile Lys Asn Met Met Ala Leu Lys Arg Asn Val Asn Phe Ile Lys
130 135 140

Lys Val Val Leu Leu Asp Ser Lys Glu Asp Met Gly Glu Ala Gln Cys
145 150 155 160

Leu Ser Asn Phe Met Ala Arg Tyr Ser Glu Pro Asn Leu Asp Val Arg
165 170 175

Asn Phe Lys Pro Arg Asp Phe Asp Ala Lys Glu Gln Val Ala Leu Ile
180 185 190

Met Ser Ser Ser Gly Thr Thr Gly Leu Pro Lys Gly Val Val Leu Thr
195 200 205

His Arg Asn Leu Ser Val Arg Phe Val His Cys Lys Asp Pro Leu Phe
210 215 220

Gly Thr Arg Thr Ile Pro Ser Thr Ser Ile Leu Ser Ile Val Pro Phe
225 230 235 240

His His Ala Phe Gly Met Phe Thr Thr Leu Ser Tyr Phe Ile Val Gly
245 250 255

Leu Arg Val Val Leu Leu Lys Arg Phe Glu Glu Lys Phe Phe Leu Ser
260 265 270

Thr Ile Glu Lys Tyr Arg Ile Pro Thr Ile Val Leu Ala Pro Pro Val
275 280 285

Met Val Phe Leu Ala Lys Ser Pro Leu Val Asp Gln Tyr Asp Leu Ser
290 295 300

Ser Ile Arg Glu Val Ala Thr Gly Gly Ala Pro Val Gly Thr Glu Val
305 310 315 320

Ala Val Ala Val Ala Lys Arg Leu Lys Ile Gly Gly Ile Leu Gln Gly
325 330 335

Tyr Gly Leu Thr Glu Thr Cys Cys Ala Val Leu Ile Thr Pro His Asp
340 345 350

Asp Val Lys Thr Gly Ser Thr Gly Arg Val Ala Pro Tyr Val Gln Ala
355 360 365

Lys Ile Val Asp Leu Thr Thr Gly Lys Ser Leu Gly Pro Asn Lys Arg
370 375 380

Gly Glu Leu Cys Phe Lys Ser Glu Ile Ile Met Lys Gly Tyr Phe Asn
385 390 395 400

Asn Lys Gln Ala Thr Glu Glu Ala Ile Asp Lys Glu Gly Trp Leu His
405 410 415

Ser Gly Asp Val Gly Tyr Tyr Asp Asp Asp Gly His Phe Phe Val Val
420 425 430

Asp Arg Leu Lys Glu Leu Ile Lys Tyr Lys Gly Tyr Gln Val Ala Pro
435 440 445

Ala Glu Leu Glu Trp Leu Leu Gln His Pro Ser Ile Lys Asp Ala
450 455 460

Gly Val Thr Gly Val Pro Asp Glu Ala Ala Gly Glu Leu Pro Gly Ala
465 470 475 480

Cys Ile Val Leu Gln Glu Gly Lys Ser Leu Thr Glu Gln Glu Ile Ile
485 490 495

Asp Tyr Ile Ala Glu Arg Val Ser Pro Thr Lys Arg Ile Arg Gly Gly
500 505 510

Val Val Phe Val Asp Asp Ile Pro Lys Gly Ala Thr Gly Lys Leu Val
515 520 525

Arg Ser Glu Leu Arg Lys Leu Leu Ala Gln Lys Lys Ser Lys Leu
530 535 540

<210> 15

<211> 543

<212> PRT

<213> Mutant Rhagophthalmus ohbai Orange Luciferase of the Invention

<400> 15

Met Ala Asn Glu Ile Ile Leu His Gly Ala Lys Pro Arg Asp Pro Leu
1 5 10 15

Asp Leu Gly Thr Ala Gly Ile Gln Leu Tyr Arg Ala Leu Thr Asn Phe
20 25 30

Ser Phe Leu Arg Glu Ala Leu Ile Asp Ala His Thr Glu Glu Val Val
35 40 45

Ser Tyr Ala Asp Ile Leu Glu Asn Ser Cys Arg Leu Ala Lys Cys Tyr
50 55 60

Glu Asn Tyr Gly Leu Arg Gln Asn Ser Val Ile Ser Val Cys Ser Glu
65 70 75 80

Asn Ser Thr Ile Phe Phe Tyr Pro Val Ile Ala Ala Leu Tyr Met Gly
85 90 95

Val Ile Thr Ala Thr Val Asn Asp Ser Tyr Thr Glu Arg Glu Leu Leu
100 105 110

Glu Thr Leu Asn Ile Ser Lys Pro Glu Leu Val Phe Cys Ser Lys Lys
115 120 125

Ala Ile Lys Asn Met Met Ala Leu Lys Arg Asn Val Asn Phe Ile Lys
130 135 140

Lys Val Val Leu Leu Asp Ser Lys Glu Asp Met Gly Glu Ala Gln Cys
145 150 155 160

Leu Ser Asn Phe Met Ala Arg Tyr Ser Glu Pro Asn Leu Asp Val Arg
165 170 175

Asn Phe Lys Pro Arg Asp Phe Asp Ala Lys Glu Gln Val Ala Leu Ile

180

185

190

Met Ser Ser Ser Gly Thr Thr Gly Leu Pro Lys Gly Val Val Leu Thr
195 200 205

His Arg Asn Leu Ser Val Arg Phe Val His Cys Lys Asp Pro Leu Phe
210 215 220

Gly Asn Arg Thr Ile Pro Ser Thr Ser Ile Leu Ser Ile Val Pro Phe
225 230 235 240

His His Ala Phe Gly Met Phe Thr Thr Leu Ser Tyr Phe Ile Val Gly
245 250 255

Leu Arg Val Val Leu Leu Lys Arg Phe Glu Glu Lys Phe Leu Ser
260 265 270

Thr Ile Glu Lys Tyr Arg Ile Pro Thr Ile Val Leu Ala Pro Pro Val
275 280 285

Met Val Phe Leu Ala Lys Ser Pro Leu Val Asp Gln Tyr Asp Leu Ser
290 295 300

Ser Ile Arg Glu Val Ala Thr Gly Gly Ala Pro Val Gly Thr Glu Val
305 310 315 320

Ala Val Ala Val Ala Lys Arg Leu Lys Ile Gly Gly Ile Leu Gln Gly
325 330 335

Tyr Gly Leu Thr Glu Thr Cys Cys Ala Val Leu Ile Thr Pro His Asp
340 345 350

Asp Val Lys Thr Gly Ser Thr Gly Arg Val Ala Pro Tyr Val Gln Ala
355 360 365

Lys Ile Val Asp Leu Thr Thr Gly Lys Ser Leu Gly Pro Asn Lys Arg
370 375 380

Gly Glu Leu Cys Phe Lys Ser Glu Ile Ile Met Lys Gly Tyr Phe Asn
385 390 395 400

Asn Lys Gln Ala Thr Glu Glu Ala Ile Asp Lys Glu Gly Trp Leu His
405 410 415

Ser Gly Asp Val Gly Tyr Tyr Asp Asp Asp Gly His Phe Phe Val Val
420 425 430

Asp Arg Leu Lys Glu Leu Ile Lys Tyr Lys Gly Tyr Gln Val Ala Pro
435 440 445

Ala Glu Leu Glu Trp Leu Leu Leu Gln His Pro Ser Ile Lys Asp Ala
450 455 460

Gly Val Thr Gly Val Pro Asp Glu Ala Ala Gly Glu Leu Pro Gly Ala
465 470 475 480

Cys Ile Val Leu Gln Glu Gly Lys Ser Leu Thr Glu Gln Glu Ile Ile
485 490 495

Asp Tyr Ile Ala Glu Arg Val Ser Pro Thr Lys Arg Ile Arg Gly Gly
500 505 510

Val Val Phe Val Asp Asp Ile Pro Lys Gly Ala Thr Gly Lys Leu Val
515 520 525

Arg Ser Glu Leu Arg Lys Leu Leu Ala Gln Lys Lys Ser Lys Leu
530 535 540

<210> 16
<211> 1638
<212> DNA
<213> Mutant *Phrixothrix* Green Luciferase

<400> 16
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gcggccagc agctgtacca gtccctgtac aagttcgctt cttccctga ggccatcatc 120
gacgcccaca ccaacgaggt gatctcctac gcccagattt tcgaaaccag ctgcccctg 180
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 tcgatgcccc tacca 75

<210> 18
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 <212> DNA
 <213> Phrixothrix Red Luciferase

<400> 18

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gatgccata c	71
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agaaaaatat ggcttgg	77
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caatgttggc gcaat	75
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gcaacatcaa atgatat	77
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<211> 73	
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atatgtacac aga	73
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gccttatgtt t	71
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gccttgatc cagtgaa	77
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atccagtgaa attta	75
<210> 27	
<211> 77	
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aaagagtttg atccctt	77
<210> 28	
<211> 77	
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<213> Phrixothrix Red Luciferase	
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acaactggat tgcctaa	77

<210> 29
 <211> 81
 <212> DNA
 <213> Phrixothrix Red Luciferase

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 gaaccgcatt aattatgaca tcatctggaa caactggcct gcctaaaggg gtagtaataa 60
 gccatagaag tataactata a 81

<210> 30
 <211> 73
 <212> DNA
 <213> Phrixothrix Red Luciferase

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 gcagtgatcc cat 73

<210> 31
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 <212> DNA
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 gtagttcctc ctccaat 77

<210> 32
 <211> 71
 <212> DNA
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<400> 32
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 ctccaaattat g 71

<210> 33
 <211> 77
 <212> DNA
 <213> Phrixothrix Red Luciferase

<400> 33
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 tcgagcttaa cgaaaaat 77

<210> 34

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<210>	35						
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attgaaagta	cat					73	
<210>	36						
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aaaaaaaggtg	caa					73	
<210>	38						
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ttggaacgcc	tatgcc					77	
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<213> Phrixothrix Red Luciferase
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<210> 40
 <211> 73
 <212> DNA
 <213> Phrixothrix Red Luciferase
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 gaaaggatata cac 73

<210> 41
 <211> 77
 <212> DNA
 <213> Phrixothrix Red Luciferase
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 agcaactcgt gatgctc 77

<210> 42
 <211> 75
 <212> DNA
 <213> Phrixothrix Red Luciferase
 <400> 42
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 atattacgac gaaga 75

<210> 43
 <211> 73
 <212> DNA
 <213> Phrixothrix Red Luciferase
 <400> 43
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 gttgcgcctg ctg 73

<210> 44
 <211> 77
 <212> DNA
 <213> Phrixothrix Red Luciferase

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gcctgctgaa ctggaaa	77	
<210> 45		
<211> 75		
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<213> Phrixothrix Red Luciferase		
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ttggaattcc ggacg	75	
<210> 46		
<211> 77		
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ttccggacga atttgct	77	
<210> 47		
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caattacctt ccgcg	75	
<210> 48		
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gttagagcct ggtaaga	77	
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<211> 73		
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aaaactcatg aga

73

<210> 50
<211> 48
<212> DNA
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48

<210> 51
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<212> DNA
<213> Rhagophthalmus ohbai Green Luciferase

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tttccttcc tgaggga

77

<210> 52
<211> 77
<212> DNA
<213> Rhagophthalmus ohbai Green Luciferase

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60

ggccctgatc gacgccc

77

<210> 53
<211> 79
<212> DNA
<213> Rhagophthalmus ohbai Green Luciferase

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60

tacggcctgc gccagaaca

79

<210> 54
<211> 79
<212> DNA
<213> Rhagophthalmus ohbai Green Luciferase

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60

gatccggcc ctgtacatg

79

<210> 55						
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acttcatggc	ccggtactcc	g				81
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ccaccggcct	gccaaaggagc	g				81
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aagagccccc	tggtg					75
<210> 58						
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gaccagtacg	acctgtcca					79
<210> 59						
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ggctgaagat	cggcg					75
<210> 60						
<211> 75						

<212> DNA
 <213> Rhagophthalmus ohbai Green Luciferase

<400> 60
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 cacttcttcg tggcg 75

<210> 61
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 <213> Rhagophthalmus ohbai Green Luciferase

<400> 61
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 ggagctgatc aag 73

<210> 62
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<210> 63
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 <212> DNA
 <213> Rhagophthalmus ohbai Green Luciferase

<400> 63
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 aggccgcccgg c 71

<210> 64
 <211> 75
 <212> DNA
 <213> Rhagophthalmus ohbai Green Luciferase

<400> 64
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 gcggcggtcg tttcg 75

<210> 65
 <211> 71
 <212> DNA
 <213> Rhagophthalmus ohbai Green Luciferase

<400> 65
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aaggcgcca c 71

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